Committee on NFPA 704

MEMORANDUM

TO: NFPA Technical Committee on Classification and Properties of Hazardous Chemical Data

FROM: Jeanne Moreau-Correia

DATE: February 9, 2010

SUBJECT: NFPA 704 A11 ROP Letter Ballot

The ROP letter ballot for NFPA 704 is attached. The ballot is for formally voting on whether or not you concur with the committee’s actions on the proposals. Reasons must accompany all negative and abstention ballots.

Please do not vote negatively because of editorial errors. However, please bring such errors to my attention for action.

Please complete and return your ballot as soon as possible but no later than Tuesday, February 23, 2010. As noted on the ballot form, please submit the ballot to Jeanne Moreau-Correia, e-mail to jmoreaucorreia@nfpa.org or fax to 617-984-7110.

The return of ballots is required by the Regulations Governing Committee Projects.

Attachment: Proposals
704-1 Log #CP4
(Entire Document)

Final Action: Accept

**Submitter:** Technical Committee on Classification and Properties of Hazardous Chemical Data,

**Recommendation:** Review entire document to: 1) Update any extracted material by preparing separate proposals to do so, and 2) review and update references to other organizations documents, by preparing proposal(s) as required.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.


2.3 Other Publications.

2.3.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.


2.3.2 UN Publications. United Nations, UN Plaza, New York, NY 10017.


2.3.4 Other Publications.


2.4 References for Extracts in Mandatory Sections.


G.1.2 Other Publications.

G.1.2.1 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D 56, Standard Method of Test for Flash Point by the Tag Closed Tester, 2005 ed.


ASTM D 93, Test Methods for Flash Point by the Pensky-Martens Closed Tester, 2008 ed.


ASTM E 1226, Test Method for Pressure and Rate of Pressure Rise for Combustible Dusts, 2005.
G.1.2.2 UN Publications. United Nations, UN Plaza, New York, NY 10017.
G.1.2.4 Other Publications.

Substantiation: To conform to the NFPA Regulations Governing Committee Projects.
Committee Meeting Action: Accept
Add new text as follows:

A fluid with a boiling point lower than -130°F (-90°C) at an absolute pressure of 14.7 psi (101.3 kPa).

The committee accepts the definition for cryogenic fluid as it has been modified in table 5.2.

The committee rejects the definition for refrigerated liquefied gas because it was rejected in 704-7 (Log #5) for addition to table 5.2, and therefore does not appear in the text of the standard.

Add new text as follows:

Polymerization – A chemical reaction that releases a large and potentially dangerous amount of heat.

The committee rejects the definition because not all polymerizations release large or potentially dangerous amounts of heat. The proposed definition does not differentiate polymerization from other reactions. The committee disagrees that a definition for polymerization is needed, because it is a commonly understood chemical process.

Add the preferred definition from the NFPA Glossary of Terms as follows:

The temperature at which the vapor pressure of a liquid equals the surrounding atmospheric pressure.

This definition is the preferred definition from the Glossary of Terms. Changing the secondary definition to the preferred definition complies with the Glossary of Terms Project.

Committee Meeting Action: Accept
Technical Committee on Classification and Properties of Hazardous Chemical Data,

Adopt the preferred definition from the NFPA Glossary of Terms as follows:

3.3.2 Fire Point. The lowest temperature at which a liquid will ignite and achieve sustained burning when exposed to a test flame in accordance with ASTM D 92, Standard Test Method for Flash and Fire Points by Cleveland Open Cup Tester. [30, 2008]

Substantiation: This definition is the preferred definition from the Glossary of Terms. Changing the secondary definition to the preferred definition complies with the Glossary of Terms Project.

Committee Meeting Action: Accept

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Technical Committee on Classification and Properties of Hazardous Chemical Data,

Adopt the preferred definition from the NFPA Glossary of Terms as follows:

3.3.3 Flash Point. The minimum temperature of a liquid at which sufficient vapor is given off to form an ignitable mixture with the air, near the surface of the liquid or within the vessel used, as determined by the appropriate test procedure and apparatus specified in Section 4.4 of NFPA 30, Flammable and Combustible Liquids Code. [30, 2008]

Substantiation: This definition is the preferred definition from the Glossary of Terms. Changing the secondary definition to the preferred definition complies with the Glossary of Terms Project.

Committee Meeting Action: Reject

Committee Statement: The scope of NFPA 704 is liquids and solids, and therefore a definition for flash point that is limited to liquids is not appropriate.
Cryogenic fluids and refrigerated liquefied gases that cause frostbite on contact resulting in irreversible tissue damage. Compressed liquefied gases with boiling points at or below -55°C (-66.5°F) that cause frostbite and irreversible tissue damage.

Health Hazard 3
Compressed liquefied gases other than cryogenic fluids and refrigerated liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that can cause severe tissue damage on contact, depending on duration of exposure.

Substantiation: Changes to Health Hazard 3 criteria are necessary because cryogenic fluids and refrigerated liquefied gases represent a greater hazard than compressed liquefied gases in the unrefrigerated or non-cryogenic state. The hazards of compressed liquefied gases have been addressed in changes submitted to Health Hazard 2 criteria. Changes to Health Hazard 2 are necessary because liquefied compressed gases with boiling points at or below -30°C (-22°F), which can cause severe damage, are recognized hazards with a severity unlike that of cryogenic fluids and refrigerated liquefied gases, which have the capability of producing irreversible tissue damage based on short term contact. The number of fluids addressed by Health Hazard 2 criteria has been expanded to address liquefied compressed gases with boiling points above those of cryogenic fluids, thereby addressing a void in the gases which are regulated.

Committee Meeting Action: Accept in Part
Revise text to read as follows:

Health Hazard 3
Cryogenic fluids that cause frostbite and irreversible tissue damage. Compressed liquefied gases with boiling points at or below -55°C (-66.5°F) that cause frostbite and irreversible tissue damage.

Health Hazard 2
Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-66.5°F) that can cause severe tissue damage on contact, depending on duration of exposure.

Committee Statement: The committee accepts the term "cryogenic fluid" to be consistent with NFPA 55. The committee rejects adding refrigerated liquefied gas as a new category because the health effects are not significantly different from other liquefied compressed gases. Therefore, there should not be separate categories for refrigerated and non-refrigerated compressed liquefied gases.
704-8   Log #CP5  
(Table 5.2)

Final Action: Accept

Submitter: Technical Committee on Classification and Properties of Hazardous Chemical Data,
Recommendation: Table 5.2 Hazard 3:
Compressed liquefied gases with boiling points at or below -55 C (-66.5 F) that cause frostbite and irreversible tissue damage.
Table 5.2 Hazard 2:
Compressed liquefied gases with boiling points between -30 C (-22 F) and -55 C (-66.5 F) that can cause severe tissue damage, depending on duration of exposure.

Substantiation: The committee reviewed the substantiating data used to develop the subject text in the Annual 2001 Report on Proposals. The substantiating data indicates that materials having boiling points between -30 C and -55 C cause freezing to exposed flesh within 1 minute, whereas materials having boiling points less than -55 C cause freezing to exposed flesh within 30 seconds. The difference in duration of exposure between 30 seconds and 1 minute is deemed meaningless in the context of the duration of an emergency response. Therefore, the committee believes that this better meets the intent of degree of hazard 3, and has modified the language accordingly.
Committee Meeting Action: Accept
NOTE: This Proposal appeared as Comment 704-3 (Log #CC4) which was held from the A2006 ROC on Proposal 704-2.

Submitter: Technical Committee on Classification and Properties of Hazardous Chemical Data,

Recommendation: In Table 6.2, Criteria column, rating 3 row, add the following:

Aerosols that pass the flame extension or drum test.

Add a new C.4 Aerosol Test Methods as follows:

C.4 Aerosol Test Methods. The definitions in 16 CFR 1500.3 can be used as follows:

“Extremely flammable contents of self-pressurized container means contents of a self-pressurized container that, when tested by the method described in Sec. 1500.45, a flashback (a flame extending back to the dispenser) is obtained at any degree of valve opening and the flashpoint, when tested by the method described in Sec. 1500.43a is less than 20°F (-6.7°C).”

Flammable contents of self-pressurized container means contents of a self-pressurized container that, when tested by the method described in Sec. 1500.45, a flame projection exceeding 18 inches is obtained at full valve opening, or flashback (a flame extending back to the dispenser) is obtained at any degree of valve opening.”

The test method procedures are described in 16 CFR 1500.43a, 16 CFR 1500.45, 16 CFR 1500.46 and ASTM D 3065, American Society for Testing and Materials, “Standard Test Methods for Flammability of Aerosol Products”. All of these test methods are sufficient to establish aerosol flammability. If any of these test methods give a negative result, the other methods should also be considered.

Substantiation: This is new material that has not had the benefit of public review. Therefore the material must be held for the next revision.

Committee Meeting Action: Accept in Principle

Add text to read as follows:

6.3 Aerosol products shall be rated based on the flash point or boiling point of the contents of the container or the results of the flame projection test as defined by ASTM D3065, Standard Test Methods for Flammability of Aerosol Products, or 16 CFR 1500.45, Method for Determining Flammable and Extremely Flammable Contents of Self-Pressurized Containers, whichever is the higher degree of hazard.

6.3.1 An aerosol material having a flame projection of 18 inches or more when tested in accordance with ASTM D3065 or 16 CFR 1500.45 shall be ranked at a degree hazard of at least 3.

Committee Statement: The committee modified the wording and location to reflect that the flammability of the contained material and the flammability of the material in aerosol form should be taken into account for products that may be released in aerosol form in an emergency situation.

Recommendation: Revise the “Criteria” column of Degree of Hazard 3 row as follows:

Finely divided solids, typically less than 75 micrometers (µm) (200 mesh), that present an elevated risk of forming an ignitable dust cloud, such as finely divided sulfur, National Electrical Code Group E dusts (e.g., aluminum, zirconium, and titanium), and bisphenol A.

Particulate materials capable of forming explosible clouds (in accordance with ASTM E1226 explosibility test) at ambient temperature.

Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated at the higher of the ratings determined by the closed cup flash point of the solvent or the ASTM E1226 explosibility test.

Revise the “Criteria” column of Degree of Hazard 2 row as follows:

Finely divided solids less than 420 µm (40 mesh) that present an ordinary risk of forming an ignitable dust cloud.

Particulate materials which support propagation along the powder train past the heated zone when tested according to the UN Recommendations on the Transport of Dangerous Goods: Model regulations – Manual of Tests and Criteria, Part III, Subsection 33.2.1, but are incapable of forming explosible clouds (in accordance with ASTM E1226 explosibility test) at ambient temperature.

Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated at the higher of the two ratings determined by the closed cup flash point of the solvent and the ASTM E1226 explosibility test.

Revise the “Criteria” column of Degree of Hazard 1 row as follows:

Materials which can not be classified into flammability hazard degrees (ratings) of 4, 3, or 2 above but that will burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes in accordance with ASTM D 6668, Standard Test Method for the Discrimination Between Flammability Ratings of F = 0 and F = 1.

Liquids, solids, and semisolids having a flash point at or above 93.4°C (200°F) (i.e., Class III B liquids).

Liquids with a flash point greater than 35°C (95°F) that do not sustain combustion when tested using the “Method of Testing for Sustained Combustibility,” per 49 CFR 173, Appendix H, or the UN publications Recommendations on the Transport of Dangerous Goods, Model Regulations and Manual of Tests and Criteria.

Liquids with a flash point greater than 35°C (95°F) in a water-miscible solution or dispersion with a water noncombustible liquid/solid content of more than 85 percent by weight.

Liquids that have no fire point when tested by ASTM D 92, Standard Test Method for Flash and Fire Points by Cleveland Open Cup, up to the boiling point of the liquid or up to a temperature at which the sample being tested shows an obvious physical change.

Combustible pellets, powders, or granules greater than 420 µm (40 mesh).

Finely divided solids less than 420 µm that are nonexplosible in air at ambient conditions, such as low volatile carbon black and polyvinylchloride (PVC).

Most ordinary combustible materials.

Solids containing greater than 0.5 percent by weight of a flammable or combustible solvent are rated at the higher of the ratings determined by the closed cup flash point of the solvent or the ASTM E1226 explosibility test.

Substantiation: Proposed changes eliminate radical inconsistencies which exist between the objectives stated in the “Degree of Hazard” column and the “Criteria” given in the second column of the table. Proposed changes also eliminate the inconsistencies between how the document treats flammability hazards produced by liquids versus dust. Proposed changes eliminate unsubstantiated and unjustifiable loopholes.

Committee Meeting Action: Reject

Committee Statement: The submitter's primary concerns appear to be the possibility that a user of the standard could mischaracterize the 75 micron particle size guideline as a mandatory limit, and that the description of degree of hazard 3 inherently dictates that all combustible particulate solids capable of forming an ignitable dust cloud should be classified as hazard 3. In this discussion, the submitter proposes that there is a conflict specific to particulate solids where hazard class 2 indicates that a material must be heated or exposed to high ambient temperatures before ignition can occur, whereas dust clouds may ignite at any temperature when an ignition source is present. The committee does not agree that the 75 micron guidance and material examples should be moved to the annex to prevent misapplication. The standard does not discount the potential for an ignition hazard to exist where particles are larger than 75 microns. The committee recognizes that the flammability hazard of suspended particles is size-dependent and justifies the distinction between a hazard class 3 and 2 by that size differential. The committee does not agree that this guidance creates an inherent conflict between the description of the degree of hazard and the
criteria.
In addition, the committee does not agree that all dusts must be classified as hazard level 3, as larger particles are less likely to form ignitable dust clouds. The committee recognizes that many factors establish the degree of hazard related to combustible particulate solids, and refers the submitter to Annex D of the 2007 edition for a discussion on this topic.

704-11 Log #CP7 (Table 6.2) Final Action: Accept

Submitter: Technical Committee on Classification and Properties of Hazardous Chemical Data,
Recommendation: Revise text to read as follows:
3 — Liquids and solids (including finely-divided suspended solids) that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. See Annex D for more information on ranking of combustible dusts.

2 — Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. These materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. Materials in this degree also include finely-divided suspended solids that do not require heating before ignition can occur (see Annex D for more information on ranking of combustible dusts).

1- Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. Materials in this degree also include finely-divided suspended solids that do not require heating before ignition can occur (see Annex D for more information on ranking of combustible dusts).

Substantiation: The committee updated the wording to insure that the descriptions of the degrees of hazard are inclusive of finely-divided suspended particulates as indicated in their respective criteria.
Committee Meeting Action: Accept
Modify existing 7.1.1, and insert a new 7.1.1.2 (renumbering subsequent sections) and add a new 7.1.1.5 and A.7.1.1.5 as follows:

7.1.1* This chapter shall address the degree of intrinsic susceptibility of materials to release energy and the degree of hazard due to reaction with ambient air, light or both.

7.1.1.1 This chapter shall apply to those materials capable of rapidly releasing energy by themselves, through self-reaction or polymerization.

7.1.1.2 This chapter shall apply to those materials capable of rapidly releasing energy by themselves under ambient conditions.

7.1.1.3 Water reactivity shall be assessed in accordance with Chapter 8.

7.1.1.4* When evaluating the hazards of organic peroxides, additional factors shall be taken into account through self-reaction or polymerization.

7.1.1.5 Reaction with ambient air shall include the ability to form hazardous peroxides and the ability to generate sufficient release of energy to cause a hazard.

A.7.1.1.5 Hazardous peroxides can form due to concentration of the original material via evaporation or by separation of the peroxide if it is insoluble in the original material.

Substantiation: This is new material that has not had the benefit of public review. Therefore the material must be held for the next revision. However, the reasons for wanting to incorporate this material are outlined below.

In the 2001 ROP, Log 704-23, the committee modified the instability table. The committee discarded the reactions with ambient air in the criteria. Materials such as diethyl ether had been rated a 1 for instability solely as a result of peroxide-forming would now be rated as zero for instability based on their intrinsic properties.

Materials such as potassium, sodium, lithium, cesium would currently be rated as a zero for instability based on intrinsic properties alone. The current system isn’t taking into account the ability of these materials to react with ambient air that contains moisture (as opposed to liquid water which Table A.8.2.1 addresses). These changes more accurately reflect the hazard of materials that are not completely isolated from ambient air and therefore can undergo hazardous reactions regardless of whether water is used in emergency response.

Committee Meeting Action: Accept in Principle

Modify existing 7.1.1, and insert a new 7.1.2 (renumbering subsequent sections) and A.7.1.2 as follows:

7.1.2* Reaction with ambient air shall include the ability to form hazardous peroxides and the ability to generate sufficient release of energy to cause a hazard.

A.7.1.2 Hazardous peroxides can form due to concentration of the original material via evaporation or by separation of the peroxide if it is insoluble in the original material. For additional information on peroxides, see NFPA 400.

7.1.34.2 Water reactivity shall be assessed in accordance with Chapter 8.

Committee Statement: The committee accepted the concept but modified the wording that was held over from the 2006 Report on Comments.
### 704-13 Log #CP8 (Table 7.2)

**Final Action: Accept**

<table>
<thead>
<tr>
<th>Submitter:</th>
<th>Technical Committee on Classification and Properties of Hazardous Chemical Data</th>
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<tbody>
<tr>
<td><strong>Recommendation:</strong></td>
<td>Revise text to read as follows:</td>
</tr>
<tr>
<td>Degree of Hazard 2; Criteria column:</td>
<td>Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 100 W/mL</td>
</tr>
<tr>
<td></td>
<td>Materials that exhibit an exotherm at temperatures less than or equal to 150 °C when tested by differential scanning calorimetry</td>
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<tr>
<td>Degree of Hazard 1, Criteria column:</td>
<td>Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 0.01 W/mL and below 10 W/mL</td>
</tr>
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<td></td>
<td>Materials that exhibit an exotherm at temperatures greater than 150 °C but less than or equal to 300 °C when tested by differential scanning calorimetry</td>
</tr>
<tr>
<td>Degree of Hazard 0, Criteria column:</td>
<td>Materials that have an instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) below 0.01 W/mL</td>
</tr>
<tr>
<td></td>
<td>Materials that exhibit an exotherm at temperatures greater than 300 °C but less than or equal to 500 °C when tested by differential scanning calorimetry</td>
</tr>
<tr>
<td></td>
<td>Materials that do not exhibit an exotherm at temperatures less than or equal to 500 °C when tested by differential scanning calorimetry</td>
</tr>
<tr>
<td><strong>Substantiation:</strong></td>
<td>The Instantaneous Power Density was added to the standard, but has not reached widespread use. Therefore, the committee restored the Differential Scanning Calorimetry guidance to the table to represent industry practice.</td>
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<tr>
<td><strong>Committee Meeting Action:</strong></td>
<td>Accept</td>
</tr>
</tbody>
</table>

### 704-14 Log #6 (A.3.3.4)

**Final Action: Accept in Part**

<table>
<thead>
<tr>
<th>Submitter:</th>
<th>John J. Anicello, Airgas Inc.</th>
</tr>
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<tbody>
<tr>
<td><strong>Recommendation:</strong></td>
<td>Revise text as follows:</td>
</tr>
<tr>
<td>When exposure to cold is prolonged or extremely low temperatures are encountered as in the case of unprotected contact with liquefied cryogenic fluids or refrigerated liquefied gases, irreversible tissue damage generally occurs. In the more severe cases of frostbite, tissue viability is affected, resulting in tissue death. Depending on the severity of tissue damage and the location affected, surgical removal or amputation of affected tissue or extremity can be necessary.</td>
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<tr>
<td><strong>Substantiation:</strong></td>
<td>This language is proposed in coordination with the terminology proposed in a separate proposed change to modify the criteria for Health Hazard 2 and 3 ratings affecting compressed gases and cryogenic fluids.</td>
</tr>
<tr>
<td><strong>Committee Meeting Action:</strong></td>
<td>Accept in Part</td>
</tr>
<tr>
<td>Revise text to read as follows:</td>
<td></td>
</tr>
<tr>
<td>When exposure to cold is prolonged or extremely low temperatures are encountered as in the case of unprotected contact with liquefied cryogenic fluids or refrigerated liquefied gases, irreversible tissue damage generally occurs. In the more severe cases of frostbite, tissue viability is affected, resulting in tissue death. Depending on the severity of tissue damage and the location affected, surgical removal or amputation of affected tissue or extremity can be necessary.</td>
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</tr>
<tr>
<td><strong>Committee Statement:</strong></td>
<td>The committee accepted the use of the term &quot;cryogenic fluid&quot; as defined in 704-2 (Log #4). The definition for &quot;refrigerated liquefied gas&quot; was rejected by the committee, and therefore will not be added to the annex material.</td>
</tr>
</tbody>
</table>
A.8.2.2 For further information on oxidizers, including oxidizer classes, see NFPA 400, Hazardous Materials Code; and NFPA 430, Code for the Storage of Liquid and Solid Oxidizers. The severity of the hazard posed by an oxidizer can be ranked according to the classification system presented in NFPA 400. This numerical class can be included in the special hazards quadrant of the NFPA 704 placard. For example, because ammonium permanganate is a Class 4 oxidizer (per NFPA 400), the special hazards quadrant would be marked OX 4 to better define the hazard.

The annex material has been updated to reflect that NFPA 430 has been absorbed into NFPA 400 and withdrawn as a stand-alone document.

Substantiation: The annex material has been updated to reflect that NFPA 430 has been absorbed into NFPA 400 and withdrawn as a stand-alone document.

Committee Meeting Action: Accept